

CLAIMS

1. A method for alleviating congestion in a computer network that includes a plurality of nodes interconnected by communication links which communicate in accordance with at least an optical layer protocol and a second protocol layer, said method comprising the steps of:
 - (a) receiving a signal in accordance with the optical layer protocol;
 - (b) determining if local forwarding capacity is available to forward the signal in accordance with the second protocol layer; and
 - (c) if the local forwarding capacity in step (b) is unavailable, forwarding the signal in accordance with the optical layer protocol to another node having excess capacity so that said another node can forward the signal in accordance with the second protocol layer.
2. The method of claim 1 wherein said second protocol layer includes a network layer protocol.
3. The method of claim 1 wherein said optical layer protocol includes wavelength division multiplexing.
4. The method of claim 2 wherein said network layer protocol is an Internet protocol.
5. The method of claim 1 wherein the signal is received in accordance with the first protocol layer by an optical switch.
6. The method of claim 5 wherein said optical switch includes an add/drop multiplexer.
7. The method of claim 5 wherein said optical switch includes an optical cross-connect.

8. The method of claim 5 wherein said optical switch is a reconfigurable optical element.

9. The method of claim 1 wherein said local forwarding capacity is provided by a packet switching element.

10. The method of claim 9 wherein said packet switching element is an IP router.

11. The method of claim 1 wherein the step of forwarding the signal in accordance with the second protocol layer includes the step of converting the signal into an electrical signal.

12. In a communication network that includes a plurality of network nodes interconnected by communication links which communicate in accordance with at least an optical layer protocol and a second protocol layer, a network node, comprising:

an optical switch receiving a signal in accordance with the optical layer protocol;

a packet switching element having a prescribed routing capacity for forwarding the signal in accordance with a second protocol layer, said optical switch forwarding the signal in accordance with the optical layer protocol to another node having excess capacity so that said another node can forward the signal in accordance with the second protocol layer if the prescribed routing capacity of the packet switching element is exceeded; and

an interface unit coupling the optical switch to the packet switching element.

13. The network node of claim 12 wherein said second protocol layer includes a network layer protocol.

14. The network node of claim 12 wherein said second protocol layer includes TCP/IP protocols.

15. The network node of claim 13 wherein said network layer protocol includes an IP protocol.

16. The network node of claim 12 wherein said optical layer protocol includes wavelength division multiplexing.

17. The network node of claim 12 wherein said packet switching element is an IP router.

18. The network node of claim 12 wherein said optical switch includes an add/drop multiplexer.

19. The network node of claim 12 wherein said optical switch includes an optical cross-connect.

20. The network node of claim 12 wherein said optical switch is a reconfigurable optical element.

21. The network node of claim 12 wherein said interface includes an optical-to-electrical converter.

22. A communication system, comprising:
a plurality of network nodes for receiving and forwarding data traffic;
at least one communication link interconnecting the network nodes, each of said nodes having a prescribed optical switching capacity and a prescribed packet switching capacity that is less than said prescribed optical switching capacity;

means, associated with a given network node, for distributing traffic to be packet switched to another one of said network nodes if said prescribed packet switching capacity of said given network node is exceeded.

23. The system of claim 22 wherein each of the plurality of network nodes includes traffic distributing means.

24. The system of claim 22 wherein said communication link is an optical communication link.

25. The system of claim 22 wherein said network nodes include an optical switch providing the prescribed optical switching capacity.

26. The system of claim 25 wherein said optical switch includes said traffic distributing means.

27. The system of claim 22 wherein said network nodes include an IP router providing the prescribed switching capacity.

28. The system of claim 24 wherein said communication link is a WDM link.

29. The system of claim 25 wherein said optical switch includes an add/drop multiplexer.

30. The system of claim 25 wherein said optical switch includes an optical cross-connect.

31. The system of claim 25 wherein said optical switch is a reconfigurable optical element.